HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Tulalip Spring Chinook
Species or Hatchery Stock:	Skagit River Spring Chinook
Agency/Operator:	Tulalip Tribes
Watershed and Region:	WRIA 7 (Snohomish), Puget Sound
Date Submitted:	March 3, 2004
Date Last Updated:	March 3, 2004

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Tulalip Tribes' Bernie Kai-Kai Gobin Salmon Hatchery, Tulalip Spring Chinook program.

1.2) Species and population (or stock) under propagation, and ESA status.

Chinook salmon (*Oncorhynchus tshwyhtscha),* Skagit River spring Chinook.

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

Name (and title): Steven Young, Hatchery Manager
Agency or Tribe: The Tulalip Tribes
Address: 10610 Waterworks Road, Tulalip WA, 98271
Telephone: (360) 651-4550
Fax: (360) 651-4460
Email: syoung@tulalip.nsn.us

Name (and title): Mike Crewson, Fishery Enhancement Biologist
Agency or Tribe: Tulalip Tribes
Address: Natural Resources Division, Fisheries/Wildlife
Department
7515 Totem Beach Rd.
Tulalip, WA. 98271
Telephone: (360) 651-4804
Fax: (360) 651-4490
Email: mcrewson@tulaliptribes-nsn.gov

Egg takes will be transported from the Washington Department of Fish and Wildlife (WDFW) Marblemount Hatchery, located on the Skagit River, to Tulalip Hatchery, by Tulalip Tribal staff. Spring Chinook broodstock that are surplus to on-station production needs at Marblemount Hatchery will be used to supply eyed eggs for this program.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Broodstock capture, holding, spawning, incubation to the eyed stage, and shocking and picking of eggs is conducted and paid for by WDFW at Marblemount. The Bureau of Indian Affairs and the Tulalip Tribes conduct and fund the remainder of this program.

Staffing level: One person quarter time from the first of October through January and one person half time from the first of January through early April of the follow year of each rearing season.

1.5) Location(s) of hatchery and associated facilities.

<u>WDFW Marblemount Hatchery</u>
8319 Fish Hatchery Lane
Marblemount, WA. 98267
(360) 873-4241

G.P.S.: Latitude: 48 degrees, 33 minutes, 26 seconds north.
Longtitude: 121degees, 14 minutes, 26 seconds west.

WRIA: 1422, (Clark Creek, River Mile 1).

<u>Tulalip Creek ponds</u>: WRIA 07.0001, RMPC Code - 3F10308 070001 R.
Near to:
7615 Totem Beach Rd.
Tulalip, WA 98271

The Tulalip Creek ponds are located just above the mouth of Tulalip Creek at Tulalip Bay. Both ponds are located in WRIA 7, stream number 0001, stream kilometer 0.1.

<u>Tulalip Tribes' Bernie Kai-Kai Gobin Salmon Hatchery</u>:
10610 Waterworks Road
Tulalip, WA. 98271
WRIA 07.0001, RMPC Code- 3F10308 070001 H.

The Bernie Kai-Kai Gobin Salmon Hatchery is located at the juncture of the east and west forks of Tulalip Creek, just above the point at which Tulalip Creek feeds into Tony's Marsh, at river kilometer 2.0.

<u>Battle (Mission) Creek rearing pond:</u>

<u>The Battle Creek pond</u> near is located near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The Battle Creek rearing pond is located approximately 200 meters upstream from Tulalip Bay in Battle (Mission) Creek in WRIA 7 (Snohomish), Stream 07.0005.

1.6) Type of program.

Isolated Harvest, Tribal Ceremonial and Subsistence, First Salmon Ceremony.

1.7) Purpose (Goal) of program.

Provide a spring Chinook salmon harvest for Tulalip Tribal members in an on-reservation, terminal area fishery. This program is designed to provide limited harvest for ceremonial and subsistence fisheries, including our First Salmon Ceremonies, which we hold in May and June each year. Formerly, Tulalip First Salmon Ceremony fish came from early spring Chinook salmon returning to the Stillaguamish and Snohomish River systems. However, since the demise of these runs in the 1950's and 60's, there have been no local, natural spring Chinook available for these ceremonies. Production from this program is also available for harvest by the non-Indian sport fishery and contributes to incidental harvest of Chinook salmon in fisheries in southeast Alaska, British Columbia, and Puget Sound preterminal areas.

1.8) Justification for the program.

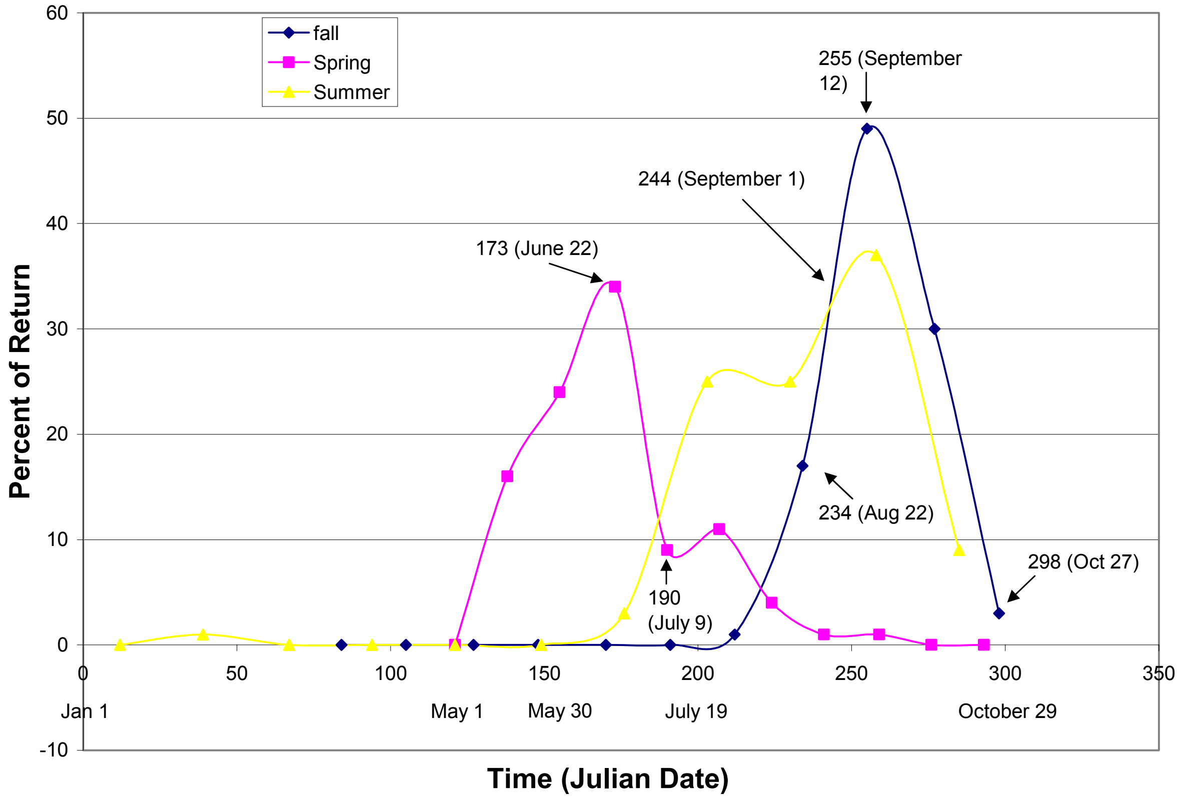
For millennia, the way of life of the Tulalip Tribes and their predecessors has been based upon the annual cycle of the return of the salmon. In particular, the First Salmon Ceremony is of special cultural and religious importance. Due to conservation concerns, Tulalip Tribal members ceased fishing on local native spring Chinook salmon runs in the 1950's. Other fisheries and environmental impacts continued, however, and there are very few or no spring Chinook remaining in the Stillaguamish and Snohomish River systems. In cooperation with the Washington Department of Fish and Wildlife, the Tulalip Tribes established the Tulalip spring Chinook program to provide limited ceremonial and subsistence opportunity on spring Chinook salmon in May and June each year. It is especially relevant that this program provides the only local source of harvestable Chinook salmon for the Tribe's First Salmon Ceremony, as well as for First Salmon Ceremonies conducted by individual families within the Tribe.

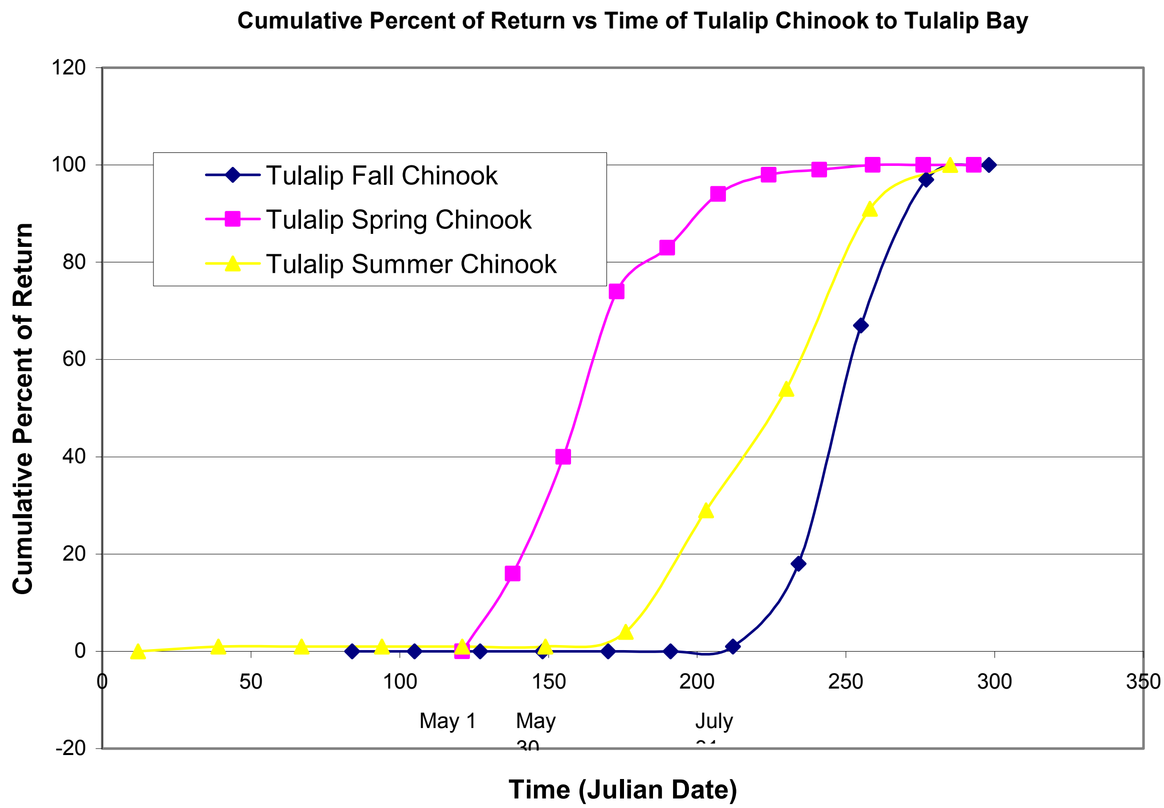
Tulalip spring Chinook are a secondary management unit in all areas, except 8D, where the fishery is managed to target Tulalip Chinook while minimizing interceptions of other Chinook stocks. All summer and fall Chinook salmon production from the Bernie Kai-Kai Gobin hatchery is otolith mass-marked and a significant proportion are also coded-wire tagged prior to their release so that hatchery fish can be identified in terminal fisheries and on natural spawning grounds. The Stillaguamish and Snohomish natural summer/fall Chinook are primary management units.

Additional, recent data on return timing below in this section), size and age at return (section 10.3), and relative survival rates of spring, summer, and fall Chinook (section 1.12) has been analyzed in this revised HGMP, results are included in appropriate sections, and are discussed below in the context of the ceremonial and subsistence needs described above in May and June annually. The conclusion at this point is that although more detailed technical analyses and policy discussions are necessary, at this time, this program will remain on hold. There are certain aspects of Tulalip spring Chinook, such as run timing and quality/composition of this early-returning fish, that appear to not be able to be replaced for Tulalip Ceremonial and Subsistence purposes at this time.

As can be seen in the coded-wire tag return timing graph on the following page, Tulalip spring Chinook initiate their return to Tulalip Bay in late-April to early May each year, their peak abundance occurs in approximately the third week of June annually, and the run is over by early October. This stock is timed to be present for Ceremonial and Subsistence fishing and the First Salmon Ceremony held at Tulalip Bay in May and June each year. Tulalip summer Chinook, the next earliest timed Chinook stock, only begin to appear in early-June, peak at the beginning of September, and that run is over by mid-October. Tulalip fall Chinook appear in Tulalip Bay in later July annually, reach peak abundance in fisheries by mid-September, and that run ends by approximately the beginning of November each year. It is apparent from the tag recovery data, that the Tulalip summer and fall Chinook stocks do not return early enough to be available for C&S, religious, and First Salmon Ceremony purposes. It is possible that since the primary source of broodstock for production releases has been changed as of the 2004 release from fall to summer Chinook, that the early tail of the summer Chinook return timing may extend earlier into May. Although that may not be early enough to provide any C&S Chinook opportunity in April in Tulalip Bay, if returns come back from the production summer Chinook releases as early as late-April or early May, they may be early enough to be present for the First Salmon Ceremony. Another problem is that Tulalip Tribal leaders and community members have expressed a strong preference for spring Chinook for Ceremonial purposes and for the First Salmon Ceremony due to their superior quality. In addition to return timing and other considerations, it remains to be seen if summer Chinook can return a month earlier than previously observed, and if so, what condition they will be in, and what acceptance they will receive for C&S purposes at Tulalip.

Time (Julian Date) at Return of Tulalip Chinook to Terminal Fishing Areas by Run





Cumulative Percent of Return vs Time of Tulalip Chinook to Tulalip Bay
Tulalip Fall Chinook
Tulalip Spring Chinook
Tulalip Summer Chinook
Cumulative Percent of Return
Time (Julian Date)
May 1
May 30
July

1.9) List of program "Performance Standards".

Goal (Section 1.7-1.8)	Performance Standard (Section 1.9)	Performance Indicator (Section 1.10)
Produce Chinook salmon to meet Ceremonial and Subsistence needs in May and June annually at Tulalip.	Hatchery spring Chinook return will provide opportunity for weekly two-day Tulalip Tribal C&S fishery for Chinook salmon in Area 8D.	On average, the estimated survival rate for the hatchery production will remain adequate to provide: ● for the recruitment of more than 500 December Age 3 fish, and ● an average terminal harvest rate > 0.95.
	Harvest directed at Tulalip Hatchery Chinook will not unduly impact listed natural populations when considered in conjunction with all other harvest-related impacts on these populations.	▪ Annual fisheries plans will project exploitation rates below the Co-managers' guidelines for all Puget Sound Chinook management units. ▪ Post-season assessments of exploitation rates on Stillaguamish and Snohomish Chinook will remain below Co-managers' guidelines.
Limit genetic and ecological impacts to natural fish populations to acceptable levels.	Hatchery production will not contribute significantly to naturally-spawning populations.	The proportion of Tulalip origin spawners in the natural spawning areas remains below Co-managers' guidelines.
	Broodstock collection will be carried out without any risks to natural population	See Marblemount Hatchery HGMP
	Release practices will not impact natural production.	Evaluate the level of interaction of hatchery spring Chinook Tulalip Bay releases with other juvenile fish in estuarine and nearshore marine areas. Test the hypothesis that the timing of the peak abundance of Tulalip spring Chinook salmon smolts and naturally-produced juvenile salmonids in Tulalip Bay, nearby estuarine, and nearshore marine areas do not differ significantly.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

Please see the performance standards in Section 1.9 above. Note, annual accomplishment of research, monitoring, and evaluation projects listed throughout this HGMP and in performance standards and indicators is contingent on availability of funding. As of 2004, most HGMP monitoring of performance indicators have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

No spring Chinook salmon will be collected in Tulalip Bay or from natural populations in the Skagit system. The Bernie Kai-Kai Gobin Salmon Hatchery will receive up to 50,000 spring Chinook eyed eggs per year from the WDFW Marblemount Hatchery. The adults captured for this program will be taken as a part of the total spring Chinook egg take at Marblemount Hatchery.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Yearling	Tulalip Bay	40,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Partial survival rates of the spring Chinook stock (0.7%) relative to Tulalip fall Chinook (0.6%) were nearly the same and were not significantly different ($p = 0.8047$) when compared by Analysis of Variance ($\alpha = 0.05$; Fisher's PLSD).

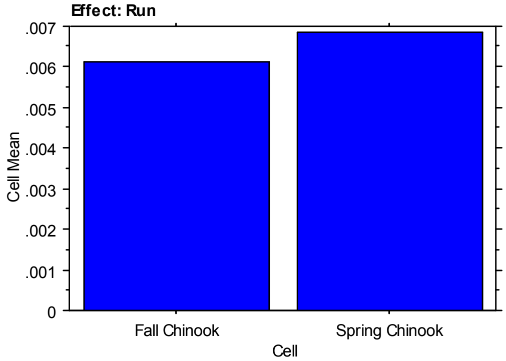
ANOVA Table for Survival Rate

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	1	1.362E-6	1.362E-6	.065	.8047	.065	.056
Residual	9	1.890E-4	2.100E-5				

Means Table for Survival Rate
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
Fall Chinook	6	.006	.004	.002
Spring Chinook	5	.007	.005	.002

Interaction Bar Plot for Survival Rate
Effect: Run



Fisher's PLSD for Survival Rate
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value
Fall Chinook, Spring Chinook	-.001	.006	.8047

In the above analysis, survival rates were estimated as total of adult equivalent (AEQ) recoveries over all ages divided by total release of coded-wire tagged Tulalip Chinook fish. The source of the AEQ recoveries is the "hrj" file from the Pacific Salmon Commission's Chinook Technical Committee. This file summarizes the results of an analysis of tag recoveries to convert them to AEQ's and to take into account both landed and non-landed mortalities in all fisheries. The above AEQ values include both fisheries and escapement, so they represent total survival.

The comparison between spring and fall Chinook survival was difficult because we didn't have the same brood years tagged and so we aren't controlling for overriding factors that might have affected survival of all Chinook in those years. Also, we tagged spring Chinook at Tulalip hatchery from brood year 1993 through 1999, but the analysis previously shown only included recoveries through brood year 1997 because 1998 and 1999 do not yet have complete recoveries in the database, and brood year 1997 had only partial recoveries of five-year-olds at this time, but since five-year-olds are such a small fraction of the total return, they were included anyway to get more data in to this preliminary analysis. Clearly, we will have to repeat this analysis in a few years when recoveries are complete through brood year 1999. With the caveat that the data and analysis are incomplete at this time, it appears that there is no difference between the survival rates of Chinook from the two programs, pending further analysis of data.

Tulalip Hatchery fall Chinook survival rate estimates
from CWTs, brood years 1986-1991.

	AEQ Recoveries at Age[a/]					CWT	AEQ Surv.
Brood Yr	**2**	**3**	**4**	**5**	**Total**	**Releases**	**Rate**
1986	274	795	1234	45	2348	191,825	1.22%
1987	44	198	329	16	587	188,110	0.31%
1988	256	593	887	75	1811	181,873	1.00%
1989	31	201	186	12	430	152,850	0.28%
1990	122	334	364	31	851	153,341	0.55%
1991	67	183	341	0	591	187,472	0.32%
						Geometric Mean:	0.52%
Age %	12.0%	34.8%	50.5%	2.7%		Arithmetic Mean:	0.61%

Tulalip Hatchery spring Chinook survival rate estimates
from CWTs, brood years 1993-1997.

	AEQ Recoveries at Age[a/]					CWT	AEQ Survival Rate
Brood Year	2	3	4	5	Total	Releases	Rate
1993	18	223	225	39	505	32,736	1.54%
1994	9	59	31	0	99	36,297	0.27%
1995	49	54	73	0	176	29,918	0.59%
1996	25	85	184	3	297	40,118	0.74%
1997	18	60	64	NA	142	50,851	0.28%
						Geometric Mean:	0.55%

Age %	9.8%	39.5%	47.3%	3.4%	Arithmetic Mean:	0.68%

1.13) Date program started (years in operation), or is expected to start.

This program started with brood year 1993, in an agreement between WDFW and the Tulalip Tribes during discussions on the Stillaguamish/Snohomish Equilibrium Brood Document.

1.14) Expected duration of program.

Indefinite. However, this program is currently on hold, pending in part on the evaluation of return timing of summer Chinook. The Tulalip Tribal enhancement program recently changed our source of broodstock for production Chinook releases from late-timed fall to earlier-timed summer Chinook. Although it is not the only factor affecting the duration of this program, one consideration is that it is not clear yet at this time whether or not there will be sufficient numbers of early Chinook returns to continue to provide the most sacred and fundamental fish, that are of special cultural and religious importance, for use by the Tribes for our First Salmon Ceremonies.

1.15) Watersheds targeted by program.

Tulalip Bay (within WRIA 7). This program is designed so that the entire return will be harvested in our terminal area fishery so that no hatchery returns will intentionally spawn naturally.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

As previously mentioned, this program is currently on hold, pending in part on the evaluation of return timing of summer Chinook as well as depending on other related key policy and self-determination issues.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

This HGMP was written and recently modified to continue to provide the basis for an incidental take permit under a 4(d) rule.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Take actions might include competition and possible predation on listed juvenile summer and fall Chinook in estuarine and nearshore marine areas following the release of program fish, however, release levels have been reduced to still achieve sufficient returns to satisfy the goals of the tribe while minimizing potential deleterious effects on natural fish upon their release.

- Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.

None known.

- **Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.**

See the WDFW HGMP for the Marblemount Hatchery for incidental effects of broodstock collection on listed populations.

Juvenile estuarine and nearshore residency of listed Puget Sound Chinook salmon may overlap with that of juveniles released by this program. Potential competitive effects are unknown at this time. Out-migration studies are currently underway in the Snohomish and Stillaguamish systems that will provide better information on the timing of local listed populations so that we can assess the extent, if any, that temporal and spatial overlap may occur. Estuarine studies are also ongoing that will provide additional data on habitat use and co-occurrence of naturally-produced juvenile fishes with releases of program fish.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- **Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.**

Currently, listed Chinook salmon populations from the Stillaguamish and Snohomish basins are above critical thresholds. Complete delineation of populations and determination of viable population thresholds has not yet been completed.

- **Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

The average hatchery survival rate from eyed egg to smolt release is approximately 80%. See AEQ survival rate comparison for released fish in Section 1.12.

- **Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

- **Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**

Not known.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take</u>

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

See the WDFW HGMP for the Marblemount Hatchery for incidental effects of broodstock collection on listed populations. Potential competitive effects are unknown at this time, however, see the last part of Section 2.2.1, which describes ongoing studies to evaluate juvenile estuarine and nearshore marine residency of listed Puget Sound Chinook salmon and program fish.

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.

See the WDFW HGMP for the Marblemount Hatchery for incidental effects of broodstock collection on listed populations.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See the WDFW HGMP for the Marblemount Hatchery for incidental effects of broodstock collection on listed populations. The extent of possible adverse competitive or predation effects of hatchery juveniles on listed populations of Puget Sound Chinook is not quantified at this time but is thought to be very low.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

See the WDFW HGMP for the Marblemount Hatchery for incidental effects of broodstock collection on listed populations and contingency plans.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

None.

3.1) **Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.**

Not applicable. ESU-wide hatchery plan for Puget Sound Chinook is currently being developed.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The Puget Sound Salmon Management Plan (PSSMP 1985) sets out the legal framework under which co-management of hatchery programs occurs. Programs at the Bernie Kai-Kai Gobin Hatchery are included in the Stillaguamish/Snohomish Equilibrium Brood Document, which is currently in draft form only. Annual production levels are agreed to by the Co-managers and are described in the Future Brood Planning Document. Hatchery escapement goals and terminal area harvest management plans are described in the annual Stillaguamish/Snohomish regional status report (produced approximately on July 1st each year). The basic agreements between WDFW and the Tulalip Tribes concerning the operation of the Bernie Kai-Kai Gobin Hatchery were set up in a series of memorandums of understanding beginning on May 29, 1981. A revised memorandum of understanding between the Tulalip Tribes and the WDFW (August 26, 1997) described changes in the Chinook program that were agreed to at that time.

3.3) Relationship to harvest objectives.

The *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Ceremonial and Subsistence harvest of Tulalip spring Chinook will be conducted in terminal area 8D where program returns have separated from other naturally-produced salmon stocks as they return to their point of release in Tulalip Bay. The Tulalip Tribes utilize time and area management and pulse fisheries to focus harvest on these returns. These methods are being evaluated through sampling of the terminal area fishery for coded-wire tags and otolith marks. All Tulalip spring Chinook will be coded-wire tagged and marked with an adipose fin clip.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest

levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The only fisheries directed at Tulalip spring Chinook will be conducted in terminal Area 8D during the time that adult hatchery fish return to Tulalip Bay (approximately May through June each year). The Tulalip Tribes will open a net fishery for Tribal members for one or two days per week. There are no recreational fisheries directed at this stock, although some incidental harvest of Tulalip spring Chinook will likely occur in winter blackmouth fisheries. Catch in the Area 8D net fishery is recorded on fish tickets. Estimates of ceremonial and subsistence catch since 1997 are as follows:

Year	Area 8D Net
1997	16
1998	10
1999	88

Harvest rates on Tulalip spring Chinook will be managed to be as close to 100% as possible. This is possible because adults return to Tulalip Bay, which does not house any other spawning populations of anadromous salmon, where hatchery returns concentrate and are targeted by the fishery. Future management of Tulalip spring Chinook will continue to focus on harvesting as close as possible to 100% of hatchery production while minimizing the impact of fisheries directed at hatchery-produced fish on listed populations. We will continue to mark spring Chinook released into Tulalip Bay with 100% coded-wire tags and adipose fin clips and sample fisheries to evaluate the success of our management in achieving these objectives.

Exploitation rates on listed populations are evaluated by the Co-managers based on total exploitation in all fisheries as described in the Co-managers' Puget Sound Chinook Management Plan. The contribution of incidental harvest of listed populations in the Area 8D fishery to overall exploitation rates is estimated with the Fisheries Regulation Assessment Model (FRAM), which has been calibrated based upon recent years' otolith samples and recoveries of coded-wire tags. In future years, we anticipate that overall exploitation rates on listed populations affected by the Area 8D fishery will be less than the Co-managers' guidelines. We will continually evaluate exploitation of these populations in the Area 8D fishery through ongoing collection of otoliths and coded-wire tags (Kit Rawson personal communication).

3.4) Relationship to habitat protection and recovery strategies.

Work groups in the Stillaguamish and Snohomish watersheds are currently in the process of assessing the major factors affecting natural salmon production and are developing habitat management plans to facilitate Chinook salmon recovery. Initial recommendations for the Snohomish basin are described in the *Initial Snohomish River Basin Chinook Salmon Conservation /Recovery Technical Work Plan (October 6, 1999).*

The Co-managers are also following a harvest management plan for Puget Sound Chinook salmon. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Currently, the Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2004, and April 30, 2009, for consideration by NOAAF. This *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. All operations of the Bernie Kai-Kai Gobin Hatchery are consistent with the above plans.

3.5) Ecological interactions.

Predators, such as river otters, mergansers, cormorants, staghorn sculpin, cutthroat trout, and dolly varden, have sometimes been observed preying upon juvenile program fish following their release into Tulalip Bay. Ecological impacts of juvenile spring Chinook salmon from this program on other species in estuarine or marine waters are thought to be very low but are currently being studied, as previously described.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Well water, and/or creek water at the Marblemount Hatchery will be used for spring Chinook egg incubation to eyed stage. Following their transfer to Tulalip, the eyed eggs will be held on well water until the alevins hatch and fry are ready to pond at the Bernie Kai-Kai Gobin Salmon Hatchery. After ponding, the combined flows of the east and west forks of Tulalip Creek will be used too supply influent to the outdoor raceways on the hatchery grounds until fingerlings are tagged, clipped, and transferred to the Battle Creek Pond, supplied by Battle Creek surface water, until the yearling smolts are released into Tulalip Bay.

Spring Chinook Incubation Water:

Please see the WDFW HGMP for the Marblemount Hatchery.

<u>Bernie Kai-Kai Gobin Hatchery Well Water:</u>
The maximum anticipated inflow will be approximately 38 liters per second (l/s) or 600 gallons per minute (gpm). The maximum anticipated summer water temperature will be approximately 10 ºC (50 ºF). The minimum winter water temperature will be approximately 8 ºC (~46 ºF).

<u>West Fork of Tulalip Creek:</u>
The maximum anticipated winter inflow will be approximately 700+ l/s or ~25+ cubic feet per second (cfs). The minimum summer flow rate will be approximately 127 l/s

(4.5cfs). The minimum winter water temperature will be approximately 1.7 ºC (35 ºF). The maximum anticipated summer water temperature will be approximately 18 ºC (65 ºF).

East Fork of Tulalip Creek:
The maximum anticipated winter inflow will be approximately 700+ l/s (~25+ cfs). The minimum summer flow rate will be approximately 85 l/s (3 cfs). The minimum winter water temperature will be approximately 1.7 ºC (35 ºF). The maximum anticipated summer water temperature will be approximately 18 ºC (65 ºF).

Battle Creek:
The maximum anticipated winter inflow will be approximately 566+ l/s (~20+ cfs). The minimum summer flow rate will be approximately 85 l/s (3 cfs). The minimum winter water temperature will be approximately 0.6 ºC (33 ºF). The maximum summer water temperature has not been measured, but thermographs will be placed in rearing ponds in the future to document temperature continuously during rearing.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water withdrawal and screening do not affect listed natural fish, which do not inhabit Tulalip or Battle Creeks. The effect, if any, of effluent discharge adversely affecting listed natural fish is minimal, but has not been evaluated.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The broodstock is collected in ponds at the WDFW Marblemount Hatchery, and further description may be found in the HGMP for that facility.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

The eyed eggs will be transported from the Marblemount Hatchery to the Tulalip Hatchery in well-washed, wet burlap sacks, which are insulated from the wind and cold during the transport.

5.3) Broodstock holding and spawning facilities.

See the WDFW HGMP for the Marblemount Hatchery.

5.4) **Incubation facilities**.

For rearing of eggs to eyed stage, please see the WDFW HGMP for the Marblemount

Hatchery.

The Tulalip Tribes' Bernie Kai-Kai Gobin Salmon Hatchery will be used for egg incubation and rearing of juveniles prior to ponding and release. One stack of eight Heath incubators will be used to incubate and hatch the eggs.

5.5) Acclimation/release facilities.

Release ponds in Tulalip and Battle Creeks were previously described in Sections 1.5 and 4.1. Battle Creek Pond, an earthen pond of approximately 6,070 square meters (1.5 acres) formed by a concrete dam on Battle Creek. The dam and pond are located about 183 meters (~200 yards) upstream from Tulalip Bay at mean tide.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

None.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

1. The handling of the broodstock, spawning, egg fertilization, and loading of incubators will be supervised by the Hatchery Manager, Enhancement Biologist, and properly-trained hatchery workers.

2. The stock will be reared on Tulalip and Battle Creeks, which are devoid of listed salmon stocks, and thus the take of any listed natural fish cannot result from equipment failure, water loss, flooding, disease transmission, or other events that could adversely affect listed fish.

3. The incubation systems of both the Marblemount and Tulalip Hatcheries are equipped with low water alarms and back-up water supplies. For further information on Marblemount incubation see the WDFW HGMP for the Marblemount Hatchery.

4. At Tulalip, we incubate on well water and have a well water holding pond with an insulated cover to maintain water temperature. If we have a power outage or some other loss of our well water supply, this pond can supply all the incubators at the hatchery with enough well water to transition onto creek water without thermally shocking the eggs. The well water holding pond and all creek water is gravity fed, thus it is not pumped or otherwise affected by power outages.

5. Both hatcheries have well-trained staff that are on duty 24 hours per day, seven days per week.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

The Tulalip Spring Chinook program uses Skagit River origin spring Chinook. These are currently obtained from surplus escapement at Marblemount Hatchery.

6.2) Supporting information.

6.2.1) History.

Please see the WDFW HGMP for the Marblemount Hatchery.

6.2.2) Annual size.

No natural fish will be collected for broodstock. Please see the WDFW HGMP for the Marblemount Hatchery for more information.

6.2.3) Past and proposed level of natural fish in broodstock.

Please see the WDFW HGMP for the Marblemount Hatchery.

6.2.4) Genetic or ecological differences.

Skagit River Marblemount Hatchery spring Chinook were founded from wild broodstock in the Suiattle River from 1976-1988. Allozyme data show that they have diverged slightly from the source population. This probably reflects unintended interbreeding with summer and fall Chinook that could not be identified at the hatchery (Marshall et al. 1995).

6.2.5) Reasons for choosing.

The early return timing of this stock resembles the timing of local spring Chinook stocks, which were formerly present and were important for the First Salmon Ceremony.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Please see the Marblemount Hatchery HGMP for broodstocking protocols.

SECTION 7. BROODSTOCK COLLECTION

Please see the Marblemount Hatchery HGMP for all of Section 7.

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

7.2) Collection or sampling design.

7.3) Identity.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

7.6) Fish transportation and holding methods.

7.7) Describe fish health maintenance and sanitation procedures applied.

7.8) Disposition of carcasses.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

Please see the Marblemount Hatchery HGMP for all of Section 8.

8.1) Selection method.

8.2) Males.

8.3) Fertilization.

8.4) Cryopreserved gametes.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish

resulting from the mating scheme.

SECTION 9. INCUBATION AND REARING

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

We will receive eyed eggs from the WDFW Marblemount Hatchery for this program. Please see the Marblemount Hatchery HGMP for broodstock and egg survival to eyed stage. Up to 50,000 eyed eggs will be transferred to the Tulalip Hatchery for incubation to hatching and emergence. Precise counts of eyed egg mortality or of swim-up fry numbers are not available, but new monitoring programs are under development at the hatchery to improve precision of these indices.

9.1.2) Cause for, and disposition of surplus egg takes.

Please see the Marblemount Hatchery HGMP. No eyed eggs surplus to Tulalip program needs are transferred to Tulalip Hatchery.

9.1.3) Loading densities applied during incubation.

The eyed egg loading density will be 6,000 eggs per Heath incubation tray.

9.1.4) Incubation conditions.

Fish will normally be incubated on 8.3 ºC (47 ºF) well water, except during the possibility of an extended power outage. In that unlikely case, east fork Tulalip Creek water will be used. Both water sources will be at or near oxygen saturation upon entry to Heath stacks and will be above 90% of saturation when the effluent leaves the Heath stacks.

9.1.5) Ponding.

Fry will be ponded when the Chinook are at or near to full absorption of their egg sacs. The exact dates of ponding will depend on the date the eggs were taken at the Marblemount Hatchery. The fry will be ponded when they are judged to be at the button-up stage, and are ready to accept salmon starter feed. They will be ponded in small, outdoor raceways at Tulalip. These early-rearing raceways are 15.3 meters (50 feet) long, by 1.2 meters (four feet) wide, by 1.2 meters (four feet) working depth (23 cubic meters or 800 cubic feet total working volume). These raceways will be screened to 7.6 meters (25 feet) in length when spring Chinook fry are first ponded to keep them at high enough densities to maximize growth and minimize feed loss until they grow larger to accommodate the full length of these raceways.

9.1.6) Fish health maintenance and monitoring.

The eyed eggs will be given a static bath treatment in a solution of 100 ppm iodifor for ten minutes when they arrive at the Bernie Kai-Kai Gobin Salmon Hatchery.

The eyed eggs will be given a prophylactic 1,667 ppm formalin flush in the Heath incubators every third day to control fungus. We will continue to use vexar matting in the Heath trays as substrate to afford alevins cover and reduce their need to swim to maintain them within the flowing water, which reduces abrasion of yolk sacs, conserves their energy, and increases early growth and fitness. All dead eggs will be removed at the Marblemount Hatchery after shocking and picking, prior to their transfer to Tulalip. No further removal of dead eggs will be done at Tulalip from this stage to ponding.

Spring Chinook will be reared at maximum densities not to exceed 227 grams (0.5 pounds) of fish per 0.03 cubic meters (1 cubic foot) of rearing space to prevent crowding stress and reduce the potential for associated amplification and transmission of infectious fish pathogens. Mortalities will be enumerated on tail screens and in the pond and raceways daily.

Washington State fish pathologists will screen a representative number of adult spring Chinook returning to the Marblemount Hatchery for pathogens that may be transmitted to the progeny. The exact number of adult fish that will be tested each year is specified in the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State based upon the disease history of this stock, the water source that it was reared on, and where it is being transferred to. These pathologists will work with State hatchery crews to prevent or minimize pre-spawning mortality of broodfish to maximize egg fertilization and survival.

Preventative care will be promoted through routine juvenile fish health monitoring at Tulalip. Northwest Indian Fisheries Commission (NWIFC) pathologists will conduct fish health exams at each rearing facility/pond on a monthly basis from emergence until release. Monthly monitoring exams will include an evaluation of rearing conditions as well as sampling small numbers of juveniles to assess their health status and to detect infectious pathogens of concern. Diagnoses will be reported to the Tulalip Hatchery Manager and the Enhancement Biologist along with any recommendations for improving or maintaining fish health, and preventing or controlling disease. Pathologists will work with the Enhancement Biologist, Hatchery Manager, and Hatchery Technicians to ensure that drugs and chemicals will be dispensed properly during treatments. The entire health history for each hatchery stock will be maintained in a relational database called AquaDoc.

Water flow rates, temperatures, fish size and loading densities, atmospheric nitrogen, dissolved oxygen content, and other environmental conditions that may affect fish health, will be routinely measured in the rearing water on a regular basis. When recommended by NWIFC fish pathologists, chemical treatments or medicated feeds will be administered to control or prevent disease. The Tulalip Tribes operate a water quality laboratory at the Bernie Kai Kai Gobin Salmon Hatchery to monitor surface waters upstream from the hatchery and rearing ponds.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

See the WDFW Marblemount Hatchery HGMP.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

The eyed egg to yearling smolt survival rate has averaged approximately 80% from delivery of the eyed eggs at Tulalip until their release into Tulalip Bay.

9.2.2) Density and loading criteria (goals and actual levels).

Rearing densities will be held under 227 grams (0.5 pounds) of fish per 0.03 cubic meters (1 cubic foot) of rearing space.

9.2.3) Fish rearing conditions

Proven, standard fish health and culture practices will be employed on each Chinook brood under hatchery culture. Rearing densities will be held as low as possible and will not exceed 0.5 lb/ft^3 in the rearing vessels shown below. Water quality parameters, such as dissolved oxygen, will be monitored on a regular basis, and general aseptic hatchery management techniques will be employed to optimize fish health and survival.

Rearing vessel dimensions and working volumes at the Tulalip Hatchery andrearing and release ponds.
Note: Rearing dimensions are at full working volume, measurements taken by range finder to high water line.

Pond Name	Length (Meters)	Length (Feet)	Width (meters)	Width (Feet)	Mean Depth (meters)	Mean Depth (Feet)	Volume (cubic meters)	Volume (cubic feet)
Small Raceways (ERT)	15	50	1.3	4	0.9	3	18	600
Deep Raceways (Chinook)	23	75	1.8	6	0.8	2.5	32	1,125
Shallow Raceways (Chinook)	23	75	1.8	6	0.2	0.8	10	337
Hatchery Pond A	46	150	18.3	60	0.9	3	764	26,992
Hatchery Pond B	30	100	17.0	56	0.9	3	466	16,466
Hatchery Pond C	30	100	15.2	50	0.9	3	418	14,760
Upper Tulalip Creek Pond	190	623	40.0	131	3.0	10	22,800	805,068
Lower Tulalip Creek Pond	49	160	20.0	66	3.0	10	2,926	103,315
Battle Creek Pond	91	300	20.0	66	3.0	10	5,486	193,715

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

These data are not currently available but are being compiled.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

These data are not currently available but are being compiled.

9.2.5) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feed Type / Size	Fish Size: Fish Per Pound (fpp)
BioVita (BioOregon) / Size 0 mash	2700 – 530 fpp
BioVita (BioOregon) / Size 1 crumble	530 – 300 fpp
Nutra Plus (Scredding) / Size 2 crumble	300 – 197 fpp
Nutra Fry (Scredding) / 1.2-1.5 mm pellet	197 – 80 fpp
Nutra Fry (Scredding) / 1.5-2.0 mm pellet	80 – 18 fpp
Nutra Fry (Scredding) / 2.0-4.0 mm pellet	18-5 fpp

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Please see Section 9.1.6 above.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not measured.

9.2.8) Indicate the use of "natural" rearing methods as applied in the program.

All fish will be transferred to Battle Creek pond, a natural earthen pond, for final rearing, imprinting, and release. They will be held in this pond for a minimum of 30 days prior to release into Tulalip Bay.

9.2.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Natural rearing conditions in the Battle Creek pond closely mimic natural rearing conditions, which minimize the possibility for adverse ecological effects on program fish prior to release. Conditions include overhead cover, earthen substrate, natural feed supplementation, in-column structure, natural inflow, natural camouflage coloration/pond color, and presence of natural predators. Program fish develop natural morphology and behavior, including more natural body coloration, predator avoidance, and natural feeding behaviors. By adapting to these natural environmental conditions, the influence of the artificial culture environment will be minimized and is thought to increase post-release survival, leading to high marine survival rates.

SECTION 10. RELEASE **Describe fish release levels, and release practices applied through the hatchery program**.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	40,000	5 fish/lb.	March 15	Tulalip Bay

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Tulalip Bay
Release point: Into Battle Creek below the rearing pond.

Major watershed: WRIA 7 (Snohomish)
Basin or Region: Battle Creek

10.3) Actual numbers and sizes of fish released by age class through the program.

Tag Code	BROOD YEAR	RELEASE START DATE	RELEASE END DATE	STOCK	RELEASE SITE	CWT/Ad	CWT Only	Ad Only	Unmarked	TOTAL NUMBER RELEASED	SIZE AT RELEASE (FPP)
212533	1993	4/20/95	4/21/95	CLARK CREEK 03.1421	BATTLE CREEK 07.0005	32736		1302	1162	35200	10
212629	1994	3/25/96	3/27/96	CLARK CREEK 03.1421	BATTLE CR 07.0005	36297		518	185	37000	7
213043	1995	3/24/97	3/26/97	CLARK CREEK 03.1421	BATTLE CR 07.0005	29918		579		30497	8
213044	1996	4/28/98	4/29/98	SKAGIT RIVER 03.0176	BATTLE CR 07.0005	40118		436	147	40701	10
213045	1997	3/25/99	3/26/99	SKAGIT RIVER 03.0176	BATTLE CR 07.0005	50851		4785		55636	12
210155	1998	3/8/00	3/10/00	SKAGIT RIVER 03.0176	BATTLE CR 07.0005	39575		4106	2099	45780	13
210176	1999	3/12/01	3/12/01	SKAGIT RIVER 03.0176	BATTLE CR 07.0005	37681	282	494	143	38600	6

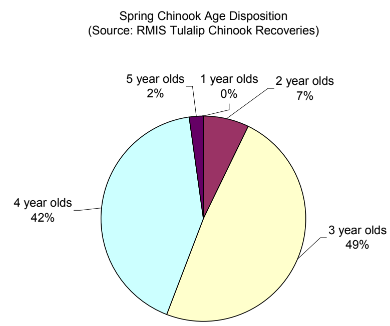
Also, see: http://www.nwifc.wa.gov/CRAS

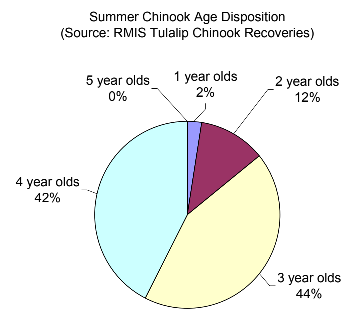
Fish size at age in program fish recovered was compared among Tulalip spring, summer, and fall Chinook. First, the relative contribution of different age classes was compared among the three Tulalip Chinook stocks using tag recoveries downloaded from the coded wire tag database (source data: Pacific States Marine Fisheries Commission Regional Mark Information System). Contributions by age were very similar among the three stocks (see table and figures below). Tulalip spring Chinook had less one- and two-year-old recoveries than did summer and fall stocks, but had more three-year-old recoveries, a similar number of four-year-olds, and an average number of five-year-olds (more than summers, less than falls).

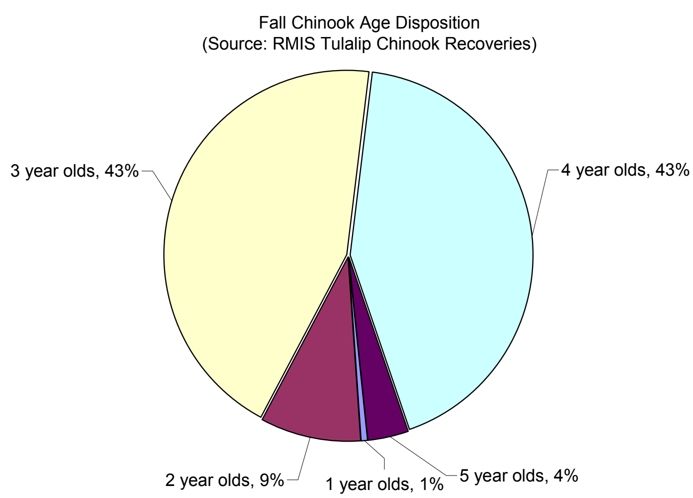
Run	Age 1	Age 2	Age 3	Age 4	Age 5
Spring	0.00%	7.00%	49.00%	42.00%	2.00%
Summer	2.00%	12.00%	44.00%	42.00%	0.00%
Fall	1.00%	9.00%	43.00%	43.00%	4.00%
Averages:	**1.00%**	**9.33%**	**45.33%**	**42.33%**	**2.00%**

To compare size (fork length) at recovery in the terminal area (hatchery rack or Tulalip terminal area fishery in Areas 8A and 8D among the three Chinook stocks reared at Tulalip, the size at age was compared among all years (to eliminate the confounding effect of age on size) and within same years to eliminate year and age as confounding variables. Coded-wire tag recovery data from run year 2002 provided the only year with adequate numbers of recoveries for three, four, and five-year olds from all three stocks, and only a small number of recoveries were available in run year 2000 to compare size within the same year for two-year-olds. Despite the low number of two-year-old recoveries available within the same run year, their size in 2000 was compared anyway since two-year-olds only comprised approximately 9% (see previous table) of the CWT recoveries that were analyzed. Regardless of the year breakout, spring Chinook had smaller forks lengths than summer and fall stocks. When size at age was compared among the three stocks without doing the analysis within the same run year, summer Chinook were significantly larger overall than Tulalip fall and spring Chinook for all age classes, and fall Chinook were significantly larger than spring for the three-, four-, and five-year-olds, but not for the overall two-year-old recoveries. Interestingly however, when size at age was compared within the same run years, fall Chinook were significantly larger than spring Chinook in all age classes in run year 2002, and were significantly larger than summer Chinook as two-year-olds in 2000. Summer Chinook were significantly larger than spring Chinook as two-year olds in 2000, and as four-year-olds in 2002.

Age breakdown of Tulalip Chinook stocks:







Size comparison at age for all years of coded-wire tag recoveries:

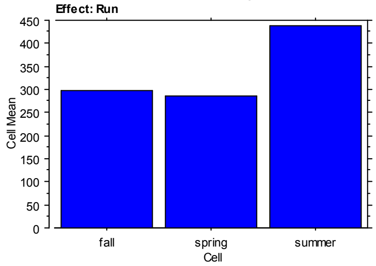
ANOVA Table for Fork Length For 2-Year-Old Tulalip Chinook

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	385562.424	192781.212	6.155	.0025	12.311	.900
Residual	216	6765020.014	31319.537				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	163	297.798	201.525	15.785
spring	35	286.486	56.998	9.634
summer	21	437.619	61.393	13.397

Interaction Bar Plot for Fork Length
Effect: Run



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
fall, spring	11.312	64.983	.7319	
fall, summer	-139.822	80.873	.0008	S
spring, summer	-151.133	96.282	.0022	S

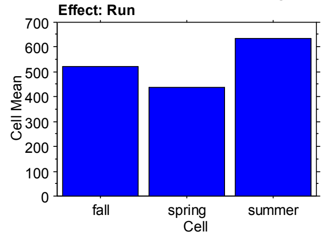
ANOVA Table for Fork Length For 3-Year-Old Tulalip Chinook

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	1361017.212	680508.606	13.188	<.0001	26.376	.999
Residual	1015	52374570.293	51600.562				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	799	520	240	8
spring	203	438	174	12
summer	16	635	113	28

Interaction Bar Plot for Fork Length
Effect: Run



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

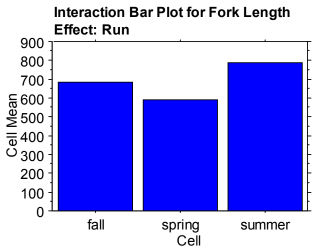
	Mean Diff.	Crit. Diff	P-Value	
fall, spring	81.905	35.035	<.0001	S
fall, summer	-115.571	112.548	.0442	S
spring, summer	-197.477	115.746	.0008	S

ANOVA Table for Fork Length For 4-Year-Old Tulalip Chinook

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	2356157.957	1178078.979	24.093	<.0001	48.186	1.000
Residual	1038	50755004.798	48896.922				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	782	687	226	8
spring	184	591	240	18
summer	75	788	66	8



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

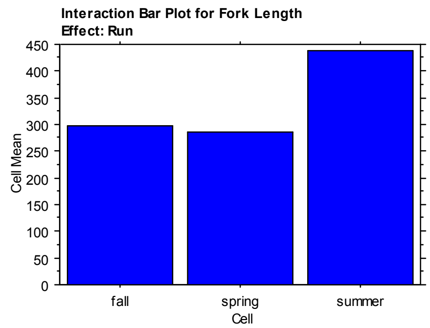
	Mean Diff.	Crit. Diff	P-Value	
fall, spring	95.686	35.553	<.0001	S
fall, summer	-101.185	52.451	.0002	S
spring, summer	-196.871	59.444	<.0001	S

ANOVA Table for Fork Length for 5-Year Old chinook

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	385562.424	192781.212	6.155	.0025	12.311	.900
Residual	216	6765020.014	31319.537				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	163	297.798	201.525	15.785
spring	35	286.486	56.998	9.634
summer	21	437.619	61.393	13.397



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
fall, spring	11.312	64.983	.7319	
fall, summer	-139.822	80.873	.0008	S
spring, summer	-151.133	96.282	.0022	S

Size at age within the same run year for Tulalip Chinook coded-wire tag recoveries:

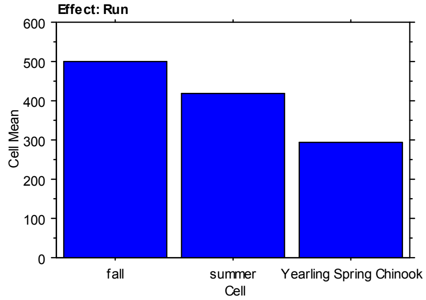
ANOVA Table for Fork Length for 2-Year-Old Tulalip Chinook in 2000

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	50436.667	25218.333	14.710	.0002	29.421	.998
Residual	17	29143.333	1714.314				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	3	500.000	62.450	36.056
summer	15	419.333	30.347	7.836
Yearling Spring Chinook	2	295.000	91.924	65.000

Interaction Bar Plot for Fork Length
Effect: Run



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
fall, summer	80.667	55.248	.0068	S
fall, Yearling Spring Chinook	205.000	79.744	<.0001	S
summer, Yearling Spring Chinook	124.333	65.759	.0009	S

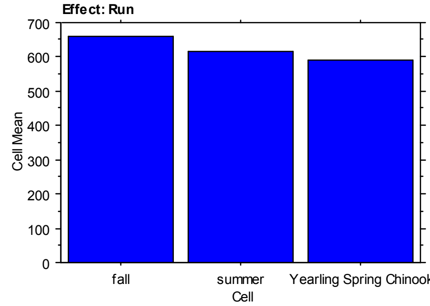
ANOVA Table for Fork Length for 3-year old Tulalip Chinook In Run Year 2002

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	44996.355	22498.177	4.172	.0196	8.344	.717
Residual	67	361313.417	5392.738				

Means Table for Fork Length
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	47	658.936	72.786	10.617
summer	15	616.467	86.161	22.247
Yearling Spring Chinook	8	589.875	44.209	15.630

Interaction Bar Plot for Fork Length
Effect: Run



Fisher's PLSD for Fork Length
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
fall, summer	42.470	43.468	.0553	
fall, Yearling Spring Chinook	69.061	56.060	.0165	S
summer, Yearling Spring Chinook	26.592	64.171	.4111	

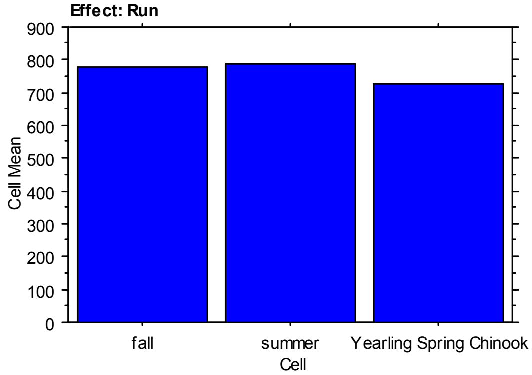
ANOVA Table for Fork Length (mm)
for 4-year-old Tulalip Chinook in 2002

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Run	2	41453.951	20726.975	4.773	.0100	9.547	.793
Residual	129	560149.019	4342.240				

Means Table for Fork Length (mm)
Effect: Run

	Count	Mean	Std. Dev.	Std. Err.
fall	44	778.068	68.993	10.401
summer	75	787.773	65.604	7.575
Yearling Spring Chinook	13	726.615	55.518	15.398

Interaction Bar Plot for Fork Length (mm)
Effect: Run



Fisher's PLSD for Fork Length (mm)
Effect: Run
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
fall, summer	-9.705	24.758	.4394	
fall, Yearling Spring Chinook	51.453	41.156	.0147	S
summer, Yearling Spring Chinook	61.158	39.169	.0025	S

10.4) Actual dates of release and description of release protocols.

See table above in Section 10.3.

The retaining screens are removed and the smolts are allowed to volitionally emigrate from the Battle Creek pond over stop logs where they drop into a splash basin below the dam into Battle Creek for the first one to two days of the release, until most have egressed. After most of the fish have left the pond, the stop logs are removed dropping the water level, which forces the remaining fish to emigrate from the pond. During this entire period, feeding is discontinued throughout the pond, and is only introduced to the area just in front of the dam and stop logs to encourage the fish to move toward the outlet.

10.5) Fish transportation procedures, if applicable.

Fish are transferred via a fish hauling truck under oxygen from the Bernie Kai-Kai Gobin

Salmon Hatchery to the Battle Creek pond.

10.6) Acclimation procedures.

A valve from Battle Creek to Tulalip Bay is opened during incoming higher high tide. This allows for several hours of mixing of marine and fresh water prior to removing the tail screens. The fish are released at higher high tide and as close to dusk as possible, which increases the depth of Battle Creek substantially, which, along with darkness, reduces the opportunity for predation from opportunistic birds and fish predators that inhabit the creek below the pond and the Bay at the mouth of the creek.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All spring Chinook released from Bernie Kai-Kai Gobin Hatchery have been coded-wire tagged and mass marked with adipose fin clips since this program was initiated (please see release table in Section 10.3).

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Not applicable.

10.9) Fish health certification procedures applied pre-release.

Fish health is monitored monthly by NWIFC fish pathologists to insure that they remain free of infectious pathogens. Fish health is examined by necropsy two weeks prior to the release by NWIFC pathologists.

10.10) 10.10) Emergency release procedures in response to flooding or water system failure.

At the Gobin Hatchery, it is always possible to change or supplement the hatchery water source to protect Chinook stocks under culture. In the event of flooding or water system failure, hatchery personnel have the ability to choose from either well water, west fork, or east fork Tulalip Creek water. Flooding is not an issue at the hatchery or at the Battle Creek pond.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

This is an isolated facility because no populations of listed fish inhabit Tulalip or Battle Creeks where fish are reared and released. Natural rearing conditions minimize adverse ecological effects as previously described in Section 9.2.9.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

Note: Annual accomplishment of monitoring and evaluation of performance indicators is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
On average, the estimated survival rate for program fish will remain adequate to provide: • for the recruitment of >500 December Age 3 fish, and • an average terminal harvest rate > 0.95.	Overall survival rate estimates will be available from CWT recoveries for Tulalip Chinook beginning in brood years 1993 and beyond.	▪ All fisheries must be sampled for coded-wire tags at appropriate rates (at least a 20% sample rate for net fisheries, at least a 10% rate for others). ▪ We will endeavor to sample the Area 8D fishery at a rate of 50% to 100%. ▪ Stock and age composition for the terminal area fishery will be determined from weekly sampling of the fishery for scales and otoliths.
Annual fisheries plans will project exploitation rates for this stock to be below the Co-managers' guidelines for all Puget Sound Chinook management units.	FRAM or a successor model will be used to make annual projections of fishery impacts.	Model inputs for the impact of the Area 8D fishery will be updated annually based on results of otolith sampling and analysis (see below for otolith sampling requirement).
Post-season assessments of exploitation rates on Stillaguamish and Snohomish Chinook will remain below the Co-managers' guidelines.	We will use post-season analysis of coded-wire tags (from indicators stocks), combined with analysis of otoliths and CWT's collected from the Area 8D fishery (from Tulalip hatchery Chinook stocks) for this.	▪ All fisheries will be sampled for coded-wire tags at appropriate rates (at least a 20% sample rate for net fisheries, at least a 10% rate for others). ▪ Otoliths must be collected from at least 100 Chinook salmon per week in the Area 8D fishery for analysis in the laboratory.
The proportion of Tulalip-origin spawners in natural spawning areas will remain below Co-managers' guidelines.	Estimate the annual contribution of Tulalip Hatchery Chinook to natural populations such that the upper bound of the 90% confidence interval is 10% contribution when the true contribution rate is 5%.	▪ Mass mark all spring Chinook production with coded-wire tags and adipose fin clips. ▪ Check all Chinook carcasses sampled in the Stillaguamish and Snohomish watersheds for CWT's with electronic "wands." ▪ See section 12 below for further information.

Performance Indicator (Section 1.10)	Monitoring Plan Objective (Section 11)	Methods/Comments (Section 11)
Evaluate the level of interaction of hatchery spring Chinook yearling smolt releases with other naturally-produced juvenile salmonids in the estuary and nearshore marine areas. Test the hypothesis that the timing of peak abundance of Tulalip spring Chinook salmon and naturally-produced salmonids in local marine waters do not differ significantly.	Estimate the abundance, temporal, and spatial distribution of any natural-origin juvenile salmonids that may be present in Tulalip Bay. Estimate the timing of the natural Chinook smolt out-migration from local rivers.	This will require a new research project to establish the optimum time/area strata for release that would minimize impacts on natural salmonid populations. Information from new in-river smolt trapping projects in the Stillaguamish and Snohomish systems and in the Snohomish estuary will be part of this research.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Please see the preceding Section 11 for M&E projects that are also research projects. All Tulalip spring Chinook have been adipose clipped and coded-wire tagged in past releases (see release table in Section 10.3). This 100% marking, contingent on funding availability, is an essential complement to monitoring the hatchery and natural Chinook contribution to escapements, for evaluations of straying, and for evaluating ecological interactions in the river, estuary, and nearshore marine areas. It would not be possible to identify the origins of Tulalip Hatchery spring Chinook without this funding for marking and tagging, and proposed mass adipose fin marking by itself will not accomplish this essential identification as to hatchery of origin that is necessary to monitor the production from this program. The Tribes and State have active Chinook coded-wire tagging and adipose fin clipping programs currently in place for the summer and fall stocks, which has also been funded through Hatchery Reform. Coded-wire tagging and adipose fin clipping of spring Chinook has primarily been funded directly by the Tulalip Tribes.

Annual accomplishment of other monitoring and research projects listed throughout this HGMP is also contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects needed for this program have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Project 1) Contribution of hatchery- and natural-origin Tulalip spring Chinook salmon to natural and hatchery spawning areas, ocean and freshwater fisheries, and escapement estimation for the Snohomish basin using coded-wire tagging, fin clipping, and recoveries in fisheries and on spawning grounds. The purpose of coded-wire tagging and adipose fin marking is to monitor the rate of contribution of Tulalip's Bernie Kai-Kai Gobin Salmon Hatchery spring Chinook to the terminal area fishery and to natural spawning populations of Chinook salmon in the Snohomish system and to determine the overall survival rate of fish from this program.

Project 2) Juvenile smolt trapping in the Skykomish and Snoqualmie Rivers. Purpose is to annually document demographic, ecological, and biological data (estimate relative abundances, total smolt yields, migration timing, relative size (fork lengths, whole body weights, condition factors), ecological interactions of Chinook and other juvenile salmonids out-migrating from the Snohomish system.

Project 3) Juvenile salmonid utilization of the Snohomish River estuary. The initial purposes of this study were to determine if use of Snohomish River estuarine habitats by juvenile Chinook salmon is correlated to life history type of the fish and attributes of the estuarine habitats. Habitat use is defined by measuring growth rates, diet, distribution, abundance, and habitats used. Life history patterns are indicated by both timing and fish size at estuarine entry, and by origin. Attributes of estuarine habitats include the geographic position of habitat in the estuary, salinity, depth, and velocity. We will obtain information on origin (Snoqualmie vs. Skykomish), timing and size of migration, and estuarine habitat utilized, as well as, a collection of scales and otoliths for comparison with future samples of scales and otoliths from adult returns.

These studies are helping us to better understand and evaluate the level of interaction of hatchery-origin summer Chinook smolts released into Tulalip Bay with natural-origin, juvenile Chinook in estuarine and nearshore habitats.

Information is being gathered on relative out-migration timing, spatial overlap, and relative abundances of Tulalip summer Chinook juvenile salmon and naturally-produced Chinook salmon in the Snohomish estuary and nearshore marine areas including Tulalip Bay, which will help to assess the potential for adverse ecological interactions among natural-origin and program Chinook juveniles such as competition or predation, upon release.

12.2) Cooperating and funding agencies.

Please see Section 12.1 also regarding the relationship of funding to proposed research, monitoring, and evaluation programs in this HGMP. The Tulalip Tribes provide funding for all projects in this HGMP (1) coded-wire tagging, adipose fin marking, and adult Chinook recovery programs in the Tulalip Tribal fishery and throughout the Snohomish basin, 2) freshwater smolt trapping, and 3) estuarine and nearshore marine trapping and seining, ecological interactions), NOAA Fisheries also provide funding for estuarine and nearshore trapping and seining, ecological interactions, and WDFW assists with adult Chinook tag recoveries from spawners collected throughout the Snohomish basin.

For project 1, coded-wire tagging and adipose fin clipping of spring Chinook has primarily been funded directly by the Tulalip Tribes. The WDFW has provided broodstock collection and egg incubation, much of the sample collection effort, and has cooperated in all phases of data analysis and interpretation. The Snohomish Public Utility District has also assisted in collecting adult carcasses from spawning grounds in the Snohomish basin. NOAA Fisheries and the Tulalip Tribes have funded estuarine and nearshore marine sampling research, and BIA Jobs in the Woods funding has supported Tulalip smolt trapping efforts.

12.3) Principal investigator or project supervisor and staff.

Project 1) Principal Investigator: Kit Rawson (Senior Fisheries Management Biologist)
Project Supervisors: Marla Maxwell (Harvest Management Biologist), Mike Crewson (Enhancement Biologist), Tulalip technician crew (Tulalip Natural Resources/Fisheries Department), Curt Kraemer, Doug Hatfield, and Darin Combs, and technician crew (WDFW);
Project 2) Smolt trapping operations: Kurt Nelson, Brian Kelder, Kit Rawson, Mike Crewson, and technician crew; Tulalip Environmental / Natural Resources Department;
Project 3) Estuarine and nearshore marine environment habitat utilization and species composition studies: Mindy Rowse and Kurt Fresh (NOAA Fisheries), Brian Kelder, Kurt Nelson, Todd Zackey, Mike Crewson, Kit Rawson (Tulalip Environmental / Natural Resources Department).

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Non-listed hatchery stock.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

For Project 1, all of the yearling spring Chinook being held at the Bernie Kai-Kai Gobin Salmon Hatchery are adipose fin clipped and marked with a coded-wire tag in the fall of the year. Publications, annual reports, draft summary reports, Biological Assessments and Opinions are available with these details for the other projects.

12.6) Dates or time period in which research activity occurs.

The yearling spring Chinook salmon are tagged in the fall of the year. Sampling plans for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

The eggs are transported from the Marblemount Hatchery to Tulalip's Bernie Kai-Kai Gobin Salmon Hatchery in washed, wet, gunny sacks, which are covered with insulation to keep them at a stable temperature. The transport of the eggs takes about 1.5 hours. They are hauled in a pick-up truck. Extra water is hauled during the transport in case the eggs must be watered down.

When the yearling spring Chinook are transported from the hatchery to Battle Creek pond, they are crowded up in the raceways and hand dipped with a fine mesh net into fish transfer truck tanks. These tanks are insulated, and are equipped with oxygen and agitators to clear the water of undesirable gases. Once at Battle Creek pond, the fish are transferred from the truck to the pond via a six-inch hose fitted to the base of the hauling tanks. The transport time from the hatchery to the pond is less than ten minutes.

Care and maintenance of live fish, eggs, holding durations, transport methods, and other details for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.8) Expected type and effects of take and potential for injury or mortality.

Spawning ground sampling will be conducted either from rafts, which have zero mortality, or by foot surveys, which may involve very minimal mortality due to possible disturbance of Chinook redds. Samplers are aware of the location of natural Chinook redds and make every effort to avoid these during sampling of carcasses. Overall mortality to listed populations will be negligible from this project. Expected type and effects of take and potential for injury or mortality for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Negligible, see above.

12.10) Alternative methods to achieve project objectives.

Not applicable. Conducting no M&E and research actions was the previous alternative, which was rejected and replaced with the Hatchery Reform monitoring projects described above.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Negligible mortality will occur to any species due to these research projects. Negligible mortality of other juvenile salmonids is thoroughly documented in the smolt trapping and estuarine trapping and seining projects.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Samplers conducting foot surveys on the spawning grounds are trained to recognize and avoid natural redds and live fish. Risk aversion measures to minimize adverse effects to listed fish as a result of the proposed research activities were previously described above or in the aforementioned reports and were specified in the assessment documents.

SECTION 13. ATTACHMENTS AND CITATIONS

Marshall, A. R., C. Smith, R. Brix, W. Dammers, J. Hymer, and L. LaVoy. 1995. Genetic diversity units and major ancestral lineages for Chinook salmon in Washington. Washington Department of Fish and Wildlife Technical Report RAD 95-02.

Puget Sound Salmon Management Plan. 1985. United States vs. Washington 1606 F. Supp. 1405.

Rawson, K. 2000. Stillaguamish Summer Chinook: Productivity Estimates from Coded-Wire Tag Recoveries and A Simple Model for Setting Interim Exploitation Rate Objectives. Tulalip Fisheries, 7515 Totem Beach Rd., Tulalip, WA. 98271.

Snohomish Basin Salmonid Recovery Technical Committee. 1999. Initial Snohomish River Basin Chinook Salmon Conservation/Recovery Technical Work Plan. Snohomish County Surface Water Management, 2731 Wetmore Ave. Ste. 300, Everett, WA. 98201-3581.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1997. Memorandum of Understanding. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA. 98271-9714.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1981. An Agreement Between the Tulalip Tribes and the Washington Department of Fisheries Concerning the Tulalip Tribes Salmon Hatchery. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA. 98271-9714.

Washington Department of Fisheries, the Stillaguamish Tribe, and the Tulalip Indian Tribes. 1992. Draft Stillaguamish/Snohomish Equilibrium Brood Document. Tulalip Indian Tribes, 7515 Totem Beach Road, Tulalip, WA. 98271-9714.